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Effect of growth chemicals, type of cutting and season, root formation of carnation *(Dianthus caryophyllus* L.*)* cutting

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ABSTRACT
The rooting formation of carnation cuttings as influenced by type of cutting growth chemicals and season was studied. The result depict that 550 ppm NAA gave best result in most of the parameters like earliness in root formation. The rooting Percentage, number of roots, root length and weight. IBA +IAA+NAA @ 550ppm each and IAA 550ppm alone were the next best treatments. Tip cutting showed better results response to growth chemicals and rooted better then basal cutting. Roting was better in rainy season as compared to winter season except for some stem parameters.

Key words: Growth, Chemicals, Season rooting cutting, Carnation,

INTRODUCTION

Carnation *(Dianthus caryophyllus L)* flower is valued for it's excellent keeping quality wide area of colours and forms and ability to dehydrate after continuous transportation**.** The carnation is one of the most important commercial flowers ranks in second in the world floriculture statistics and held a share of 19% (Singh and dad loin 1984). Carnation can be propagated by terminal stem cutting, seed and also by tissue culture. The seed propagation is mainly used for border carnation, while the perpetual carnation is propagated vegetative. However, commercially on large scale specialist propagator uses the micro propagation. Year round propagation can be done carnation provided temperature inside the poly house is maintained at 21^{0}C with 70-80% relative humidity (1) the type of cuttings to be used and the correct time of planting to rooting of carnation are important aspects to be investigated upon

The effectiveness of auxins to induce rooting improvement in rooting percentage and survival of rooted cutting has been studied (2) there exist a lot of carnation on the optimum concentration not only with the nature and concentration of the auxin and of plant species, but also with session *(4*). The present work was thus undertaken to find out the optimum concentration of the auxins required for root initiation, vegetative growth and further survival of cuttings. The selection of suitable plant material and best season for cornation propagation.

MATERIALS AND METHODS

The experiment was the conducted at the Horticultural Research farm, C.S.A University Kanpur during 2000-2001.The terminal and Basal cutting of cornation variety a standard type were collected cutting were taken from healthy stock plants grown in polyhouse cuttings 10-12 cm long having 3-5 pairs of leaves with acute 0.5cm below the node were taken washed coarse sand was used as the rooting media .the rooting media was filled in polythene bags of 15cm 5cm size which was drenched with 0-15 percent bavistin a day better to planting of cuttings to prevent rooting of cutting. The experimental design selected was factorial completely randomized block design. Eight growth chemicals treatments were tried including the control.15 cutting were used for each treatment, replicated thrice .The basal portion of the cutting were dipped in the growth chemicals solutions for 12minute for all treatments, including distilled water control. They were air-dried for few seconds and immediately planted any same medium to a depth of 1.25-2.15cm. The experiment was conducted in a naturally controlled polyhouse. Intermittent misting was given with hand spray pump every, 15 cutting were kept separately for each treatment in the polyhouse was maintained between 25-30 ^{0}C. The medium was drenched with bavistin (0-15%) at fortnight intervals to check fungal infection.

The first planting was done in the first week of September in year 2001. The mean maximum temperature for September was 25.3 ^{0}C and the mean minimum temperature was 20 ^{0}C with a rainfall of 21mm and relative humidity of 80.5%. The second planting was done in the first week of November, When the mean maximum temperature was 30 ^{0}C and the mean minimum temperature was 10.6 ^{0}C with a rainfall of 3.5 mm and relative humidity was 60.9%.

RESULTS AND DISCUSSION

The time taken to root was less in tip cuttings than in basal cutting during both season (Table- 1). It was variable for all treatments than control in both type of cutting during season, but no difference was observed during winter season, where all treatments were at par with control.

The higher concentrations of root promoting chemicals in

Table 1 : The time required for rooting and percentage rooting in carnation cuttings is influenced by type of cuttings, growth chemicals and season.

Name of treatment	Time of rooting						Grand mean	Rooting percentage						Grand mean
	Rainy season			Winter season				Rainy season			Winter season			
	Tip	Basal	Mean	Tip	Basal	Mean		Tip	Basal	Mean	Tip	Basal	Mean	
IAA550ppm	15.80	20.80	18.30	17.25	24.25	20.15	19.52	91.11	24.45	57.78	77.75	17.75	47.75	52 76
IBA550ppm	10.80	22.35	16.57	18.35	24.70	21.52	19.04	84.40	22.23	53.31	57.75	15.85	36.66	44.98
NAA550ppm	9.80	13.80	11.80	13.80	18.80	16.30	14.05	86.67	26.75	56.71	77.70	22.20	49.95	53.33
IAA+IBA@550ppm	14.60	16.30	15.45	15.94	23.62	19.78	17.61	68.90	22.25	45.56	75.50	17.70	46.60	46.07
IAA+NAA@550ppm	14.98	16.60	15.79	18.20	19.24	18.72	17.25	75.50	17.75	46.62	75.50	11.12	43.31	44.96
IBA+NAA@550ppm	10.16	15.50	12.83	14.60	23.25	18.92	15.87	77.75	13.40	45.57	55.50	11.13	33.31	39.44
IAA+IBA+NAA550ppm	12.85	15.20	14.02	15.91	19.50	17.20	15.61	80.15	22.25	51.20	51.12	17.75	34.43	42.81
Control	20.90	24.40	22.65	24.70	17.15	20.92	21.78	28.90	8.90	18.90	20.15	4.40	12.27	15.58
	Type of cutting		Growth chemical		Interaction			Type of cutting		Growth chemical		Interaction		
C.D. at 5%	R	W	R	W	R	W		R	W	R	W	R	W	
	0.32	2.21	0.92	NS	NS	0.87		4.57	4.80	9.12	0.61	12.90	13.58	

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leaves and less differentiation of tissues with more meristematic cells in tip cuttings which are capable of developing in to Adventists root may be season for earlier as rotting of basal cuttings may be due to lack of nutrition, insufficient axons or the accumulation of resin in the stem or some inhibitory chemicals .

In tip and basal cuttings, 550 ppm. NAA gave the earliest rooting during rainy season. During winter season, earliest rooting was observed with 550 ppm NAA. The time required for rooting was less during rainy season than during winter season. The root primordial, exogenous applications of axing hastence the process of root initiation. (4) suggested that enhanced hydrolytic activity in the presence of exogenously applied hormones was responsible for increased rooting of auxin treated cuttings.

The % of the rooted cuttings was more during rainy season than the during winter season. The presence of optimum temp. & Humidity during rainy season has compared to winter may be the reason of higher rooting % during rainy season (3) found that the root promoting effect of NAA (200ppm) was more marked when

Table 2 : Length of carnation and number of roots as influenced by type of cuttings, growth chemicals and season.

Name of treatment	Number of Roots/Cutting						Grand mean	Rooting percentage						Grand mean
	Rainy season			Winter season				Rainy season			Winter season			
	Tip	Basal	Mean	Tip	Basal	Mean		Tip	Basal	Mean	Tip	Basal	Mean	
IAA550ppm	11.60	4.35	7.97	10.58	4.01	7.54	7.75	7.80	3.40	5.60	5.90	3.46	4.68	5.03
IBA550ppm	8.95	3.50	6.22	18.25	3.25	5.75	5.98	7.12	2.98	5.05	7.15	2.50	4.82	4.43
NAA550ppm	14.21	5.02	9.70	12.48	4.45	8.46	9.08	10.50	4.30	7.40	9.50	4.02	6.76	7.08
IAA+IBA@550ppm	11.30	4.50	7.90	9.05	4.05	6.55	7.22	8.12	3.86	5.99	5.50	3.30	4.40	5.19
IAA+NAA@550ppm	11.90	3.50	7.70	8.79	3.30	6.04	6.87	8.45	2.80	5.62	5.82	2.42	4.12	4.82
IBA+NAA@550ppm	10.96	3.65	7.30	10.10	3.42	6.76	7.03	7.90	2.90	5.40	7.43	2.20	4.81	5.10
IAA+IBA+NAA550ppm	12.25	3.90	8.07	11.98	3.82	7.90	7.98	8.78	3.38	6.08	6.90	3.36	5.13	5.60
Control	4.30	2.78	3.54	4.89	1.60	3.24	3.39	3.85	2.44	3.14	2.70	1.10	1.90	2.52
	Type of cutting		Growth chemicals		Interaction			Type of cutting		Growth chemical		Interaction		
C.D. at 5%	R	W	R	W	R	W		R	W	R	W	R	W	
	0.45	0.32	0.91	0.64	1.31	0.91		0.28	0.39	0.59	0.80	0.82	1.14	

presence optimum temp. And atmospheric humidity during rainy season may be the reason for better rooting with axing treatment. There were no differences between treatments and control during winter season, which may be due to externally low night temp. And relatively less atmospheric humidity earlier (3) observed satisfactory root formation in carnation at 26^0 C.

The % of tip cuttings rooted was 91.11 and 77.75 during rainy & winter season, respectively while the % of basal cuttings rooted was 26.75 & 17.75 during rainy & winter season, respectively (Table-1). The better rooting of tip cutting is most probably due to higher concentration of root promoting chemicals formed in the apical shoots, which are translocated to the base of shoots and more available softwood cuttings of 25 ornamentals species were taken June than in march.

The number of roots in tip cutting was than in basal cuttings. (Table 2). The high amount of growth promoting chemicals in leaves and better mobilization of food reserves in tip cuttings and earlier rooting, may be the reasons for more number of roots in the tip cuttings.

The treatment 550 ppm NAA was superior over others during both rainy and winter season. During both seasons, NAA promoted more number of roots per cutting and was superior over other growth regulators; all growth chemicals treatments gave higher number of roots per cutting than control. The more number of roots obtained

Table 3 : Dry and fresh weight of roots as influenced by type of cuttings, growth chemicals and season in carnation.

Treatment	Fresh Weight (g)						Grand mean	Dry Weight (mg)						Grand mean
	Rainy season			Winter season				Rainy season			Winter season			
	Tip	Basal	Mean	Tip	Basal	Mean		Tip	Basal	Mean	Tip	Basal	Mean	
IAA550ppm	3.70	1.15	2.42	3.35	1.15	2.25	2.33	36.15	11.45	23.80	33.95	11.30	22.62	23.21
IBA550ppm	3.41	1.00	2.20	2.45	0.75	1.60	1.90	36.65	10.44	23.69	26.50	10.67	18.58	21.13
NAA550ppm	4.33	1.35	2.84	3.90	1.20	2.55	2.69	62.30	13.30	37.80	55.52	12.95	34.23	36.01
IAA+IBA@550ppm	2.55	0.40	1.47	2.35	0.65	1.50	1.53	32.50	10.80	21.65	31.05	8.40	19.72	20.68
IAA+NAA@550ppm	2.90	0.45	1.67	2.39	0.40	1.39	1.53	33.35	5.16	19.25	28.65	5.10	16.89	18.07
IAA+IBA+NAA@550ppm	3.85	0.80	2.32	2.60	0.80	1.70	2.01	41.25	10.33	25.79	35.45	9.94	22.69	24.24
Control	1.37	0.32	0.84	0.65	0.15	0.80	0.82	14.23	3.48	8.85	6.50	2.30	4.40	6.62
	Type of cutting		Growth chemicals		Interaction			Type of cutting		Growth chemicals		Interaction		
C.D. at 5%	R	W	R	W	R	W		R	W	R	W	R	W	
	0.15	0.21	0.30	0.40	0.42	0.57		1.80	1.80	3.60	3.60	5.11	5.10	

carbohydrates, thereby aid in rooting. During rainy season, the treatment 550 ppm IAA gave the highest % of rooting in tip cuttings, while 550 ppm NAA gave the highest rooting in basal cuttings during winter season 550 ppm IAA and 550 ppm NAA gave the highest rooting % in tip cuttings & 550 ppm NAA in Basel cuttings. A similar increase rooting % in carnation stem cuttings, using growth chemicals (IAA, IBA & NAA) has been reported by (3). Auxins are known to increase the cell division by increasing the level of endogenous cytokinin, resulting in the induction of more number of with the add of growth chemicals clearly reflects that they not only initiate rooting but also help in subsequent rapid growth of roots in numerical strength.

The superiority NAA in promoting better rooting. The combination IAA + IBA+NAA @ 550ppm also gave good results.

The number of roots per cutting was more during rainy seasons than during winter season. The presence of optimum growing conditions during rainy season may be the reason of increased number of roots per cutting. The mean length of roots was more in

tip cutting than in basal cuttings (Table 2). The earliness in rooting may have resulted in the formation of longer roots in the cuttings. The presence of sufficient auxins in tip cuttings may have helped in cell division and cell enlargements, which resulted in longer roots and more mean length of roots during both season, 550 ppm NAA promoted the maximum mean length of roots, which was superior over other treatments as well as over control.

NAA at 550 ppm promoted the maximum mean length of roots and was significantly superior over other treatments for tip cuttings with basal cuttings 550 ppm NAA promoted the maximum mean root length during winter season, 500ppm NAA also promoted the maximum mean length of root in both tip and basal cutting (Audus 1963) stated that the characteristic property of auxins was there action in stimulating growth in length of cell in their relevant growth stage. It appears likely that auxins initiate synthesis of structural or enzyme proteins in the process of adventitious root formation. Auxin application to cuttings increase the root length through the process of acidification the greater root promoting activity of NAA may be due the attraction in the proportion of different Amino acid in the portions of NAA treated cuttings earlier (5) observed increased root length in carnation.

The length of longest root was more during rainy season than during winter season. The presence of higher humidity during rainy season might have helped in the better absorption of water by root, which subsequently increase in length. The fresh & dry weight of roots was higher in tip cuttings than in basal (Table 3). In both seasons, highest fresh & dry weights of roots were obtained with 550ppm NAA. The higher number of roots & length of roots in tip cutting resulted in to higher fresh & dry weight in tip cutting fresh & dry weight of roots were higher during rainy season than winter season. The results on dry weight of roots are reflective of the other root parameters observed.

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